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## (TWENTY-EIGHTH) AWARD OF THE DONOHOE COMET-MEDAL.

The Comet-Medal of the Astronomical Society of the Pacific has been awarded to C. D. PERRINE, Assistant Astronomer in the Lick Observatory, for his discovery of an unexpected comet on October 16, 1897.

The Committee on the Comet-Medal,
EDWARD S. HOLDEN.
J. M. SCHAEBERLE.

December 16, 1897.

## ASTRONOMICAL OBSERVATIONS IN 1897.

Made by TORVALD KÖHL, at Odder, Denmark.

### VARIABLE STARS.

### *Z Cygni.**

| | | |
|---|---|---|
| January | 1: | Z invisible. |
| | 2: | id. |
| February | 3: | id. |
| | 4: | id. |
| | 24: | = e. |
| | 27: | id. |
| April | 19: | = a. |
| | 29: | > a.<br>< 26. |
| May | 23: | = b. |
| August | 22: | invisible. |
| September | 11: | id. |
| | 25: | < e. |
| | 27: | id. |
| October | 20: | id. |
| | 25: | id. |
| November | 8: | id. |
| | 11: | a little < d. |
| | 14: | > d.<br>< c. |
| December | 13: | a little > a. |
| | 18: | = a. |
| | 19: | id. |

### *The Stars A and B, near $X^2$ Cygni.*†

| | | |
|---|---|---|
| January | 1: | A > B. |
| | 2: | A = B. |
| February | 4: | id. |
| April | 29: | id. |
| May | 23: | id. |
| September | 14: | A > B. |
| | 27: | A < B. |
| October | 20: | id. |
| | 25: | id. |
| November | 8: | A = B. |
| | 11: | A < B. |
| December | 19: | A < B. |

The star A is reddish.

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* *Vide* the sketch in the *Publications* A. S. P., No. 48, page 69.

† *Vide* the sketch in the *Publications* A. S. P., No. 34, page 37, and the observations in No. 48, page 71.

### *S Ursæ majoris.*

January 2: $\left\{\begin{array}{l} < \text{d.} \\ > \text{e.} \end{array}\right.$
27: id.
February 4: $\left\{\begin{array}{l} < \text{c.} \\ > \text{d.} \end{array}\right.$
24: = d.
27: id.
March 31: $\left\{\begin{array}{l} < \text{e.} \\ > \text{f.} \end{array}\right.$
April 19: = g.
29: invisible.
May 23: id.
August 27: = d.

September 11: $\left\{\begin{array}{l} > \text{d.} \\ < \text{c.} \end{array}\right.$
14: id.
18: a little > d.
25: id.
27: id.
October 20: a little < e.
25: < e.
November 11: = f.
14: id.
December 13: < g.
18: id.

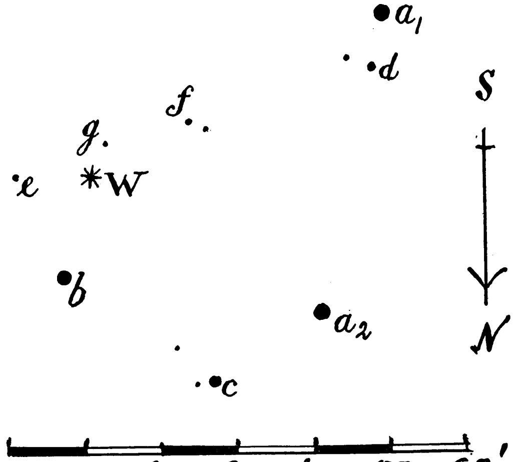
### *T Ursæ majoris.*

The star was invisible on all the dates on which *S Ursæ majoris* was watched, with the exception of the following dates:—

March 31: T < g.
April 19: $\left\{\begin{array}{l} > \text{f.} \\ < \text{e.} \end{array}\right.$

May 23: a little > b.
August 27: = g.

### *W Pegasi* [$a_1$ a little > $a_2$ ].



The Region about *W Pegasi.*

August 22: W $\left\{\begin{array}{l} < \text{b.} \\ > \text{c.} \end{array}\right.$
23: a little < b.
September 18: < b.
October 20: a little < c.
21: id.
25: id.
26: id.

November 14: < c.
December 13: $\left\{\begin{array}{l} < \text{f.} \\ = \text{g.} \end{array}\right.$
18: id.
19: a little < g.

## *14 and 16 Comæ Berenicis.*

For many years I have perceived a slight variation in the stars *14* and *16 Comæ*, namely:—

| | | | |
|---|---|---|---|
| 1879, | March | 20: | $14 > 16$. |
| 1880, | January | 19: | id. |
| | March | 8: | id. |
| | December | 9: | $14 = 16$. |
| 1881, | March | 28: | $14 > 16$. |
| | April | 18: | $14 = 16$. |
| 1882, | January | 14: | $14 > 16$. |
| | February | 21: | id. |
| | November | 19: | id. |
| 1885, | April | 12: | id. |
| 1887, | March | 16: | id. |
| 1891, | March | 9: | id. |
| 1893, | April | 5: | id. |
| 1894, | March | 28: | $14 < 16$. |
| | April | 8: | $14 = 16$. |
| 1895, | March | 2: | $14 > 16$. |
| | November | 27: | $14 < 16$. |
| | December | 11: | $14 = 16$. |
| 1896, | March | 4: | $14 < 16$. |
| | | 11: | $14 = 16$. |
| | | 17: | id. |
| | | 31: | $14 > 16$. |
| | May | 1: | $14 = 16$. |
| | | 4: | id. |
| | | 9: | id. |
| 1897, | January | 2: | $14 = 16$. |
| | February | 24: | id. |
| | | 27: | id. |
| | March | 31: | id. |
| | April | 19: | $14 < 16$. |
| | December | 19: | $14 = 16$. |

## *12 and 13 Comæ Berenicis.*

These two stars also seem to have a slight variation in brightness.

| | | | |
|---|---|---|---|
| 1894, | March | 28: | $13 = 12$. |
| | April | 8: | $13 < 12$. |
| 1895, | March | 2: | $13 = 12$. |
| | December | 11: | $13 > 12$. |
| 1896, | March | 17: | $13 = 12$. |
| | May | 1: | $13 < 12$. |
| | | 4: | $13 = 12$. |
| | May | 9: | $13 < 12$. |
| 1897, | January | 2: | $13 = 12$. |
| | February | 24: | $13 < 12$. |
| | | 27: | id. |
| | March | 31: | id. |
| | April | 19: | id. |
| | December | 19: | id. |

Besides the above-mentioned observations, a great many other sketches of fixed stars have been made with reference to supposed variations.

## FIREBALLS.

In the past year twelve fireballs have been seen from stations in Denmark.

| No. | | Time. | Beginning. | End. | Mag. | Station. | Note. |
|---|---|---|---|---|---|---|---|
| 1 | January | 26, $9^h$ $12^m$ P. M. | 272° + 55° | 238° + 35° | ¼ ☾ | Stevns. | Explosion. |
| 2 | April | 19, 8 15 P. M. | 30° alt. SE. | 10° alt. NE. | ☾ | Lögten. | Train. |
| 3 | May | 17, 10 26 P. M. | SW. | 254° + 12° | ♀ | Copenhagen. | Train. |
| 4 | July | 27, 9 13 P. M. | 30° alt. NW. | 40° alt. SSE. | ✻ | Nestved. | Red. |
| 5 | | 31, 10 50 P. M. | 220° + 13° | 208° + 14° | ✻ | Copenhagen. | |
| 6 | October | 15, 5 50 P. M. | NE. | 45° alt. SW. | ♀ | Hilleröd. | |
| 7 | | 20, 12 20 A. M. | | NW. | ☾ | Odder. | Near the horizon. |
| 8 | | 20, 7 11 P. M. | NW. | | ✻ | Copenhagen. | |
| 9 | | 21, 7 57 P. M. | 270° + 30° | 264° + 10° | * | Odder. | |
| 10 | November | 25, 6 28 P. M. | 191° + 40° | 120° + 30° | ♃ | Svendborg. | Train. |
| | | | 30° azimuth<br>W. from N.<br>20° altitude. | 15° azimuth<br>E. from N.<br>14° altitude. | ♃ | Copenhagen. | Train. |
| 11 | | 25, 11 50 P. M. | | SSE. | ¼ ☾ | Samsö. | Blue. Explosion. |
| 12 | December | 21, 5 15 P. M. | Zenith. | E. | ☾ | Fanö. | Train. |

The little observatory in the garden of the Real School at Odder has been altered in the past year, so that the dome which formerly could be opened in six directions can now be turned around.

## FIRST AWARD OF THE BRUCE MEDAL.

The award for 1898 of the BRUCE Medal of the Astronomical Society of the Pacific has been made to Professor SIMON NEWCOMB.

## SPECTROSCOPIC BINARY STARS.

BY R. G. AITKEN.

The announcement made in Harvard College Observatory *Circular*, No. 21, that $\beta$ *Lupi* is a spectroscopic binary, calls new attention to one of the most interesting classes of stars known. Binary star systems—that is, systems comprising two suns in orbital motion about a common center of gravity—have been known since the time of HERSCHEL; but their periods of revolution are reckoned in years and even in centuries. The most rapid binary known at the beginning of the present decade needed eleven and a half years to complete a single revolution. Small wonder then, that the startling announcements made by PICKERING and VOGEL that $\zeta$ *Ursæ majoris* made a complete revolution in about 105 (later reduced to 52) days, and that $\beta$ *Persei (Algol)*, $\beta$ *Aurigæ*, and $\alpha$ *Virginis* had periods of from 2.9 to 4 days, should be received with caution and even with suspicion.

It is true, indeed, that GOODRICKE, who discovered the variable character of the light of *Algol* in 1782, suggested an eclipse of the visible star by a dark body as a plausible explanation of the periodic dimming of its light. But another explanation that found favor was, that *Algol* was a bright star, upon whose photosphere spots analogous to our sun-spots were irregularly distributed, the periodic time of light variation corresponding to the time of axial rotation. At best, GOODRICKE'S hypothesis was classed with other theories, convenient as explanations, but not susceptible of proof. The modern spectroscope, however, by demonstrating that the spectrum of the star was sensibly the